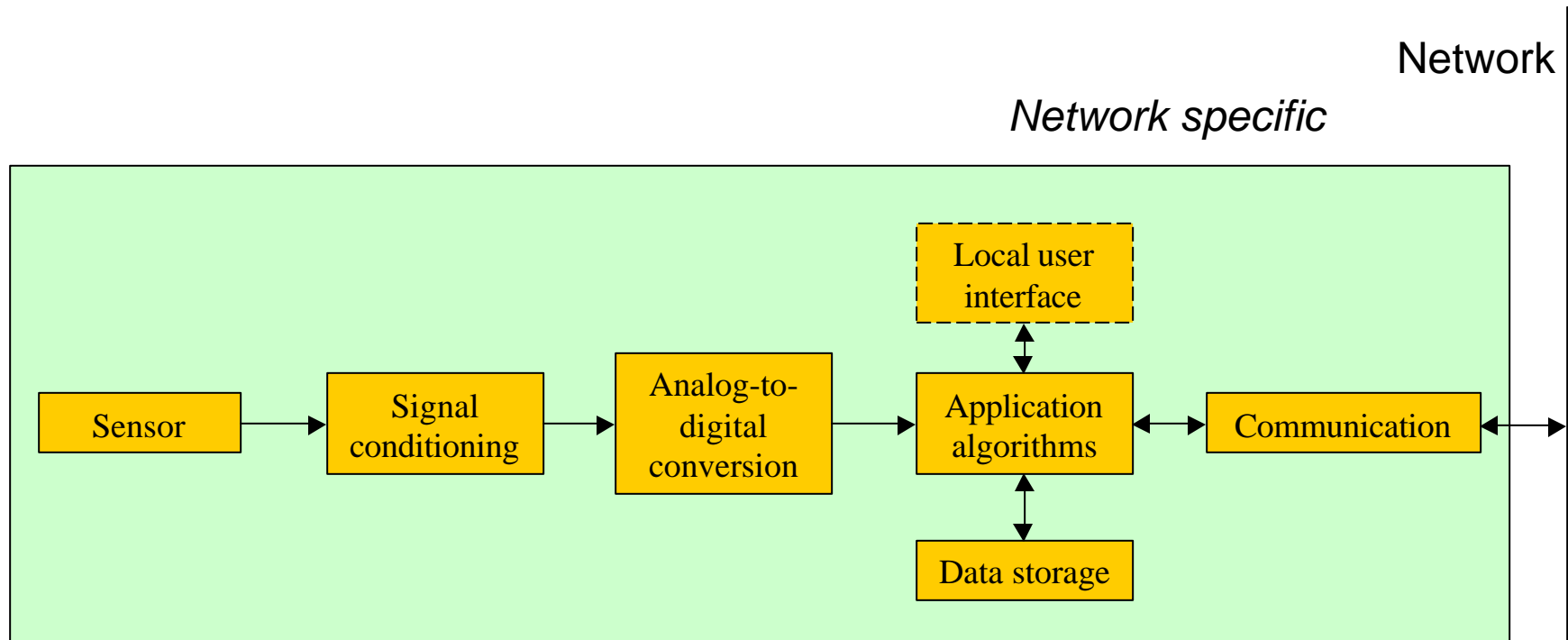


Key technical features of IEEE Std 1451.2-1997

Stan Woods

**Agilent Technologies
October 4, 2001**

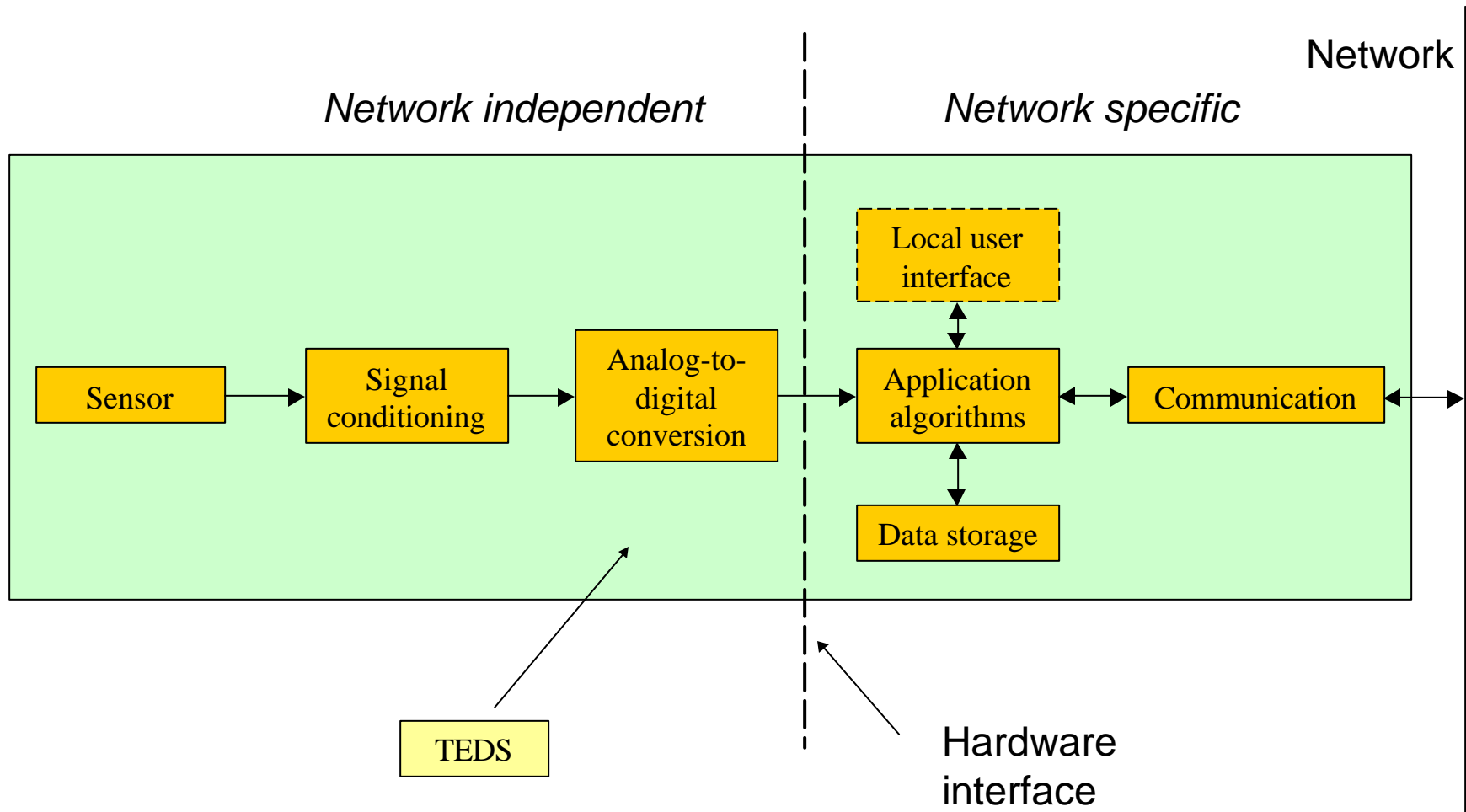
A general model of a smart sensor



Some points regarding “smart”:

- Moving intelligence closer to the point of measurement/control.
- Confluence of transducers, computation and communication towards common goal.
- Goal: make it cost effective to integrate/maintain distributed systems.

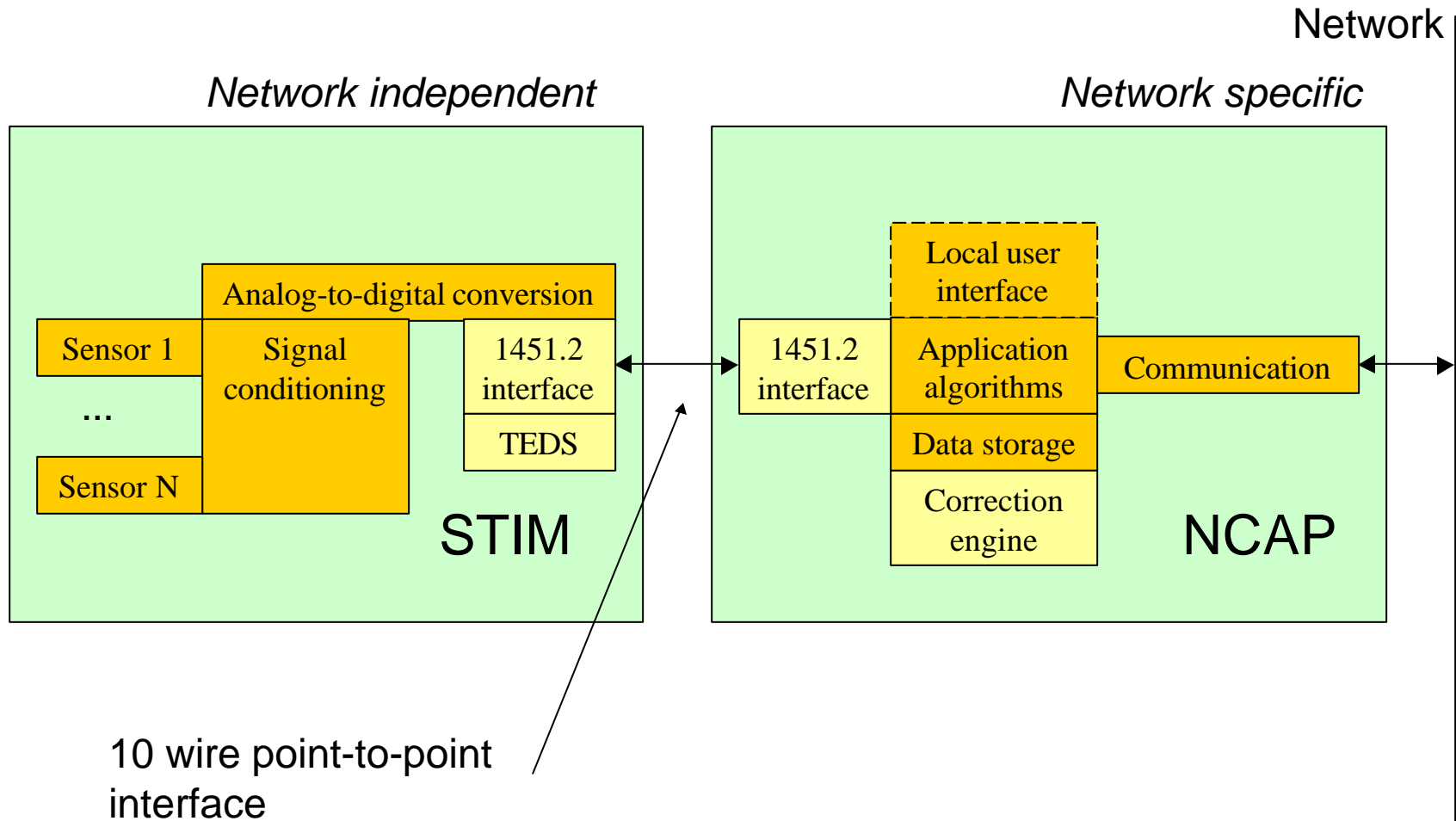
1451.2 *partition*



IEEE Std 1451.2-1997 distinguishing features

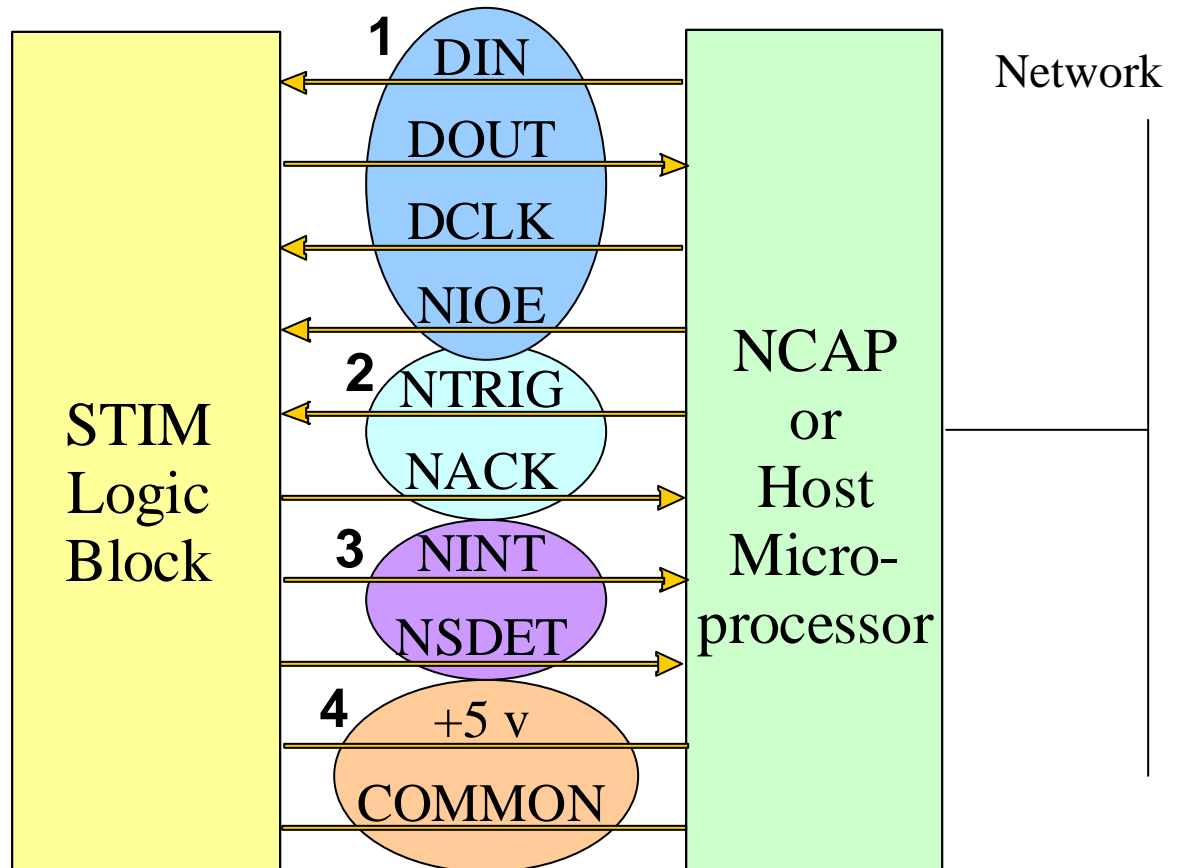
- Extensible Transducer Electronic Data Sheet (TEDS)
- General calibration/correction model for transducers.
- Physical units representation based on SI units.
- Triggering and control model defines how channels are accessed.
- All channels may be triggered simultaneously, timing parameters are used to indicate channel differences.
- Models for different kinds of sensors
- Powerful concept/location of correction engine allows flexibility in system design.

1451.2 smart sensor model

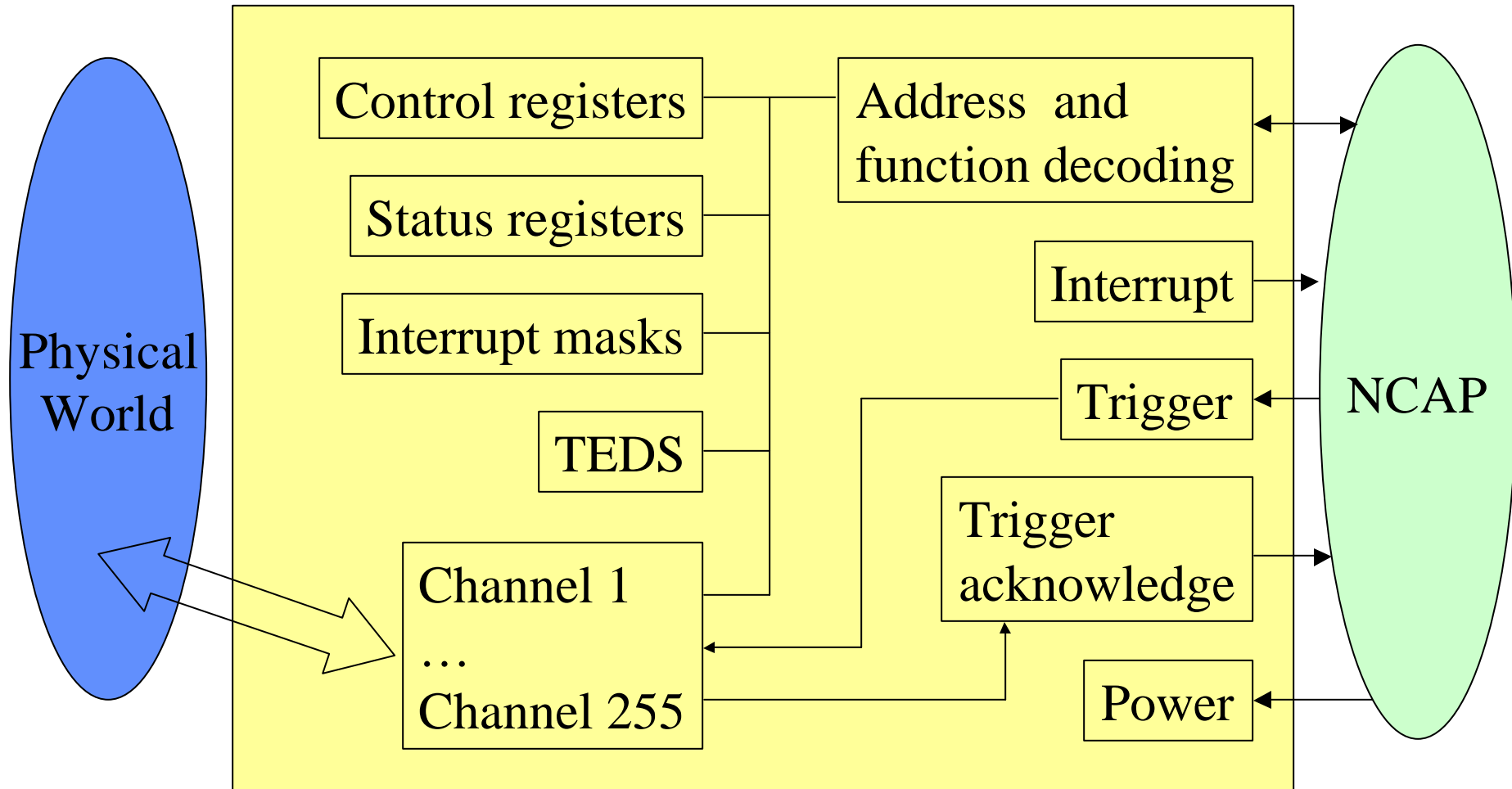


1451.2 hardware interface

- 1) Communication
- 2) Triggering/**handshaking**
- 3) Interrupts and hot swap
- 4) Power



STIM control/data model



1451.2 TEDS blocks

Machine readable

Meta-TEDS
(mandatory)

**Channel
TEDS**
(mandatory)

**Calibration
TEDS**

Human readable

**Meta-ID
TEDS**

**Channel ID
TEDS**

**Calibration
ID TEDS**

Application specific

**End Users'
Application
specific
TEDS**

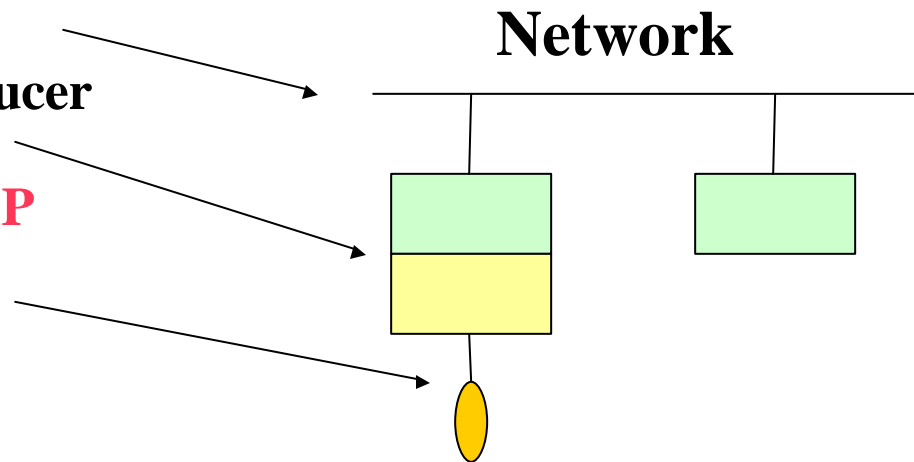
Future extensions

**Industry
Extension
TEDS**

System issues addressed by 1451.2 architecture

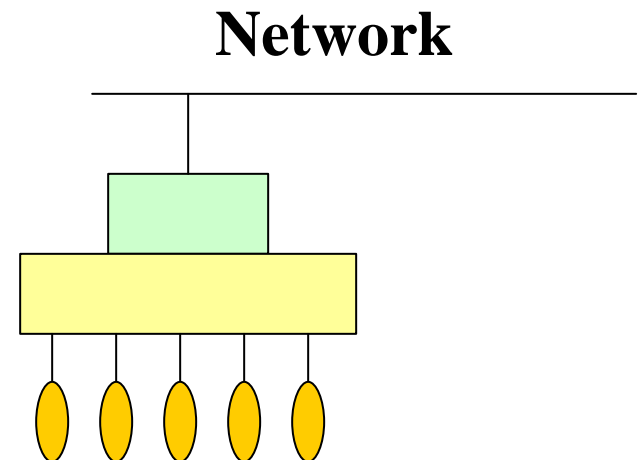
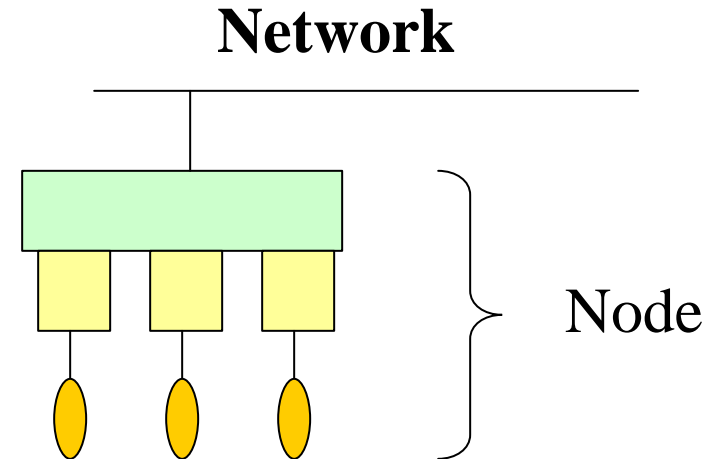
1451.2 Architecture

- Distance is achieved with the network
- Plug and play at the transducer level with short distance interface (or hidden if NCAP and STIM are integrated).
- Last few feet achieved with analog wiring.

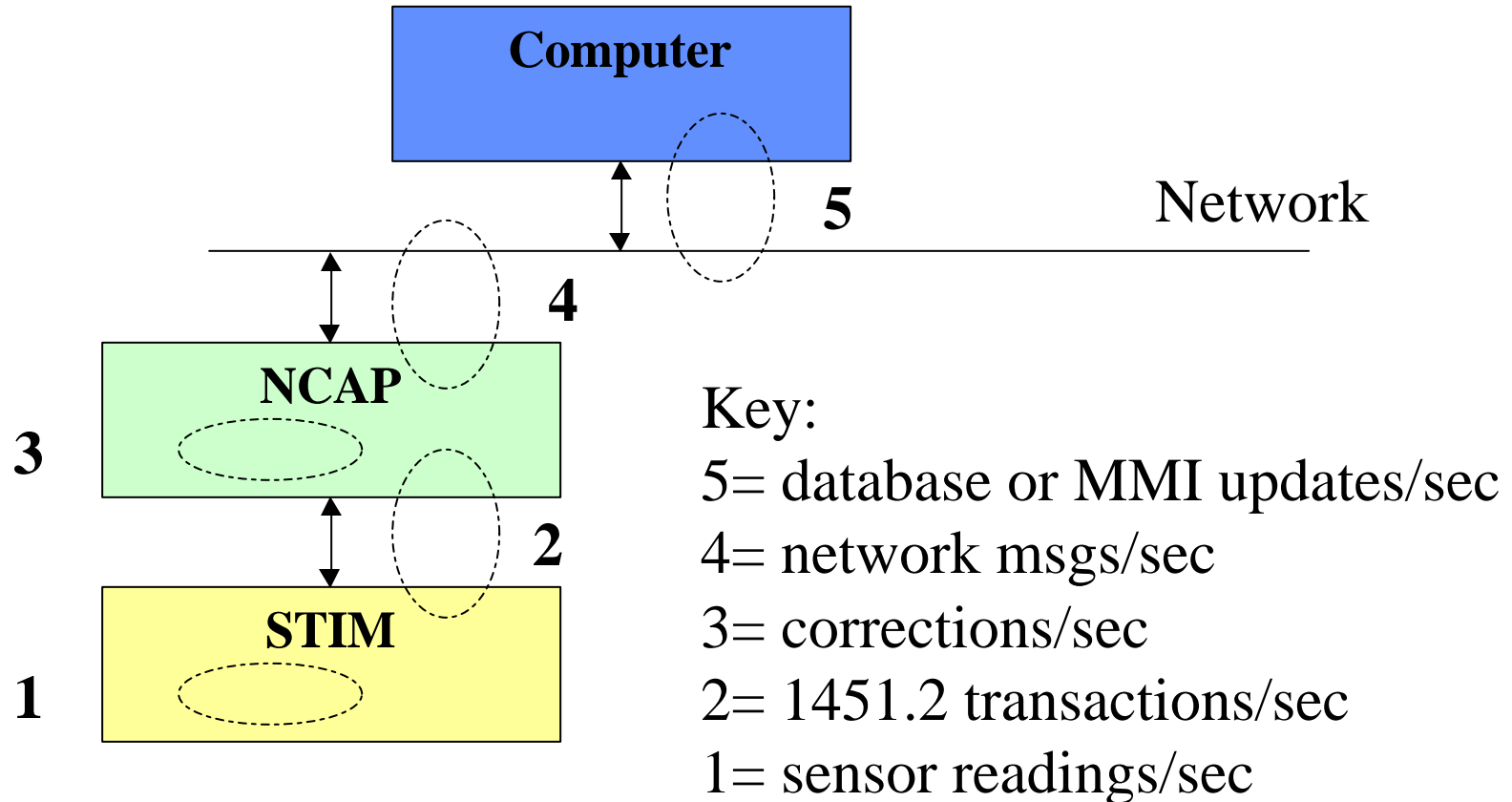


Node Design Tradeoffs

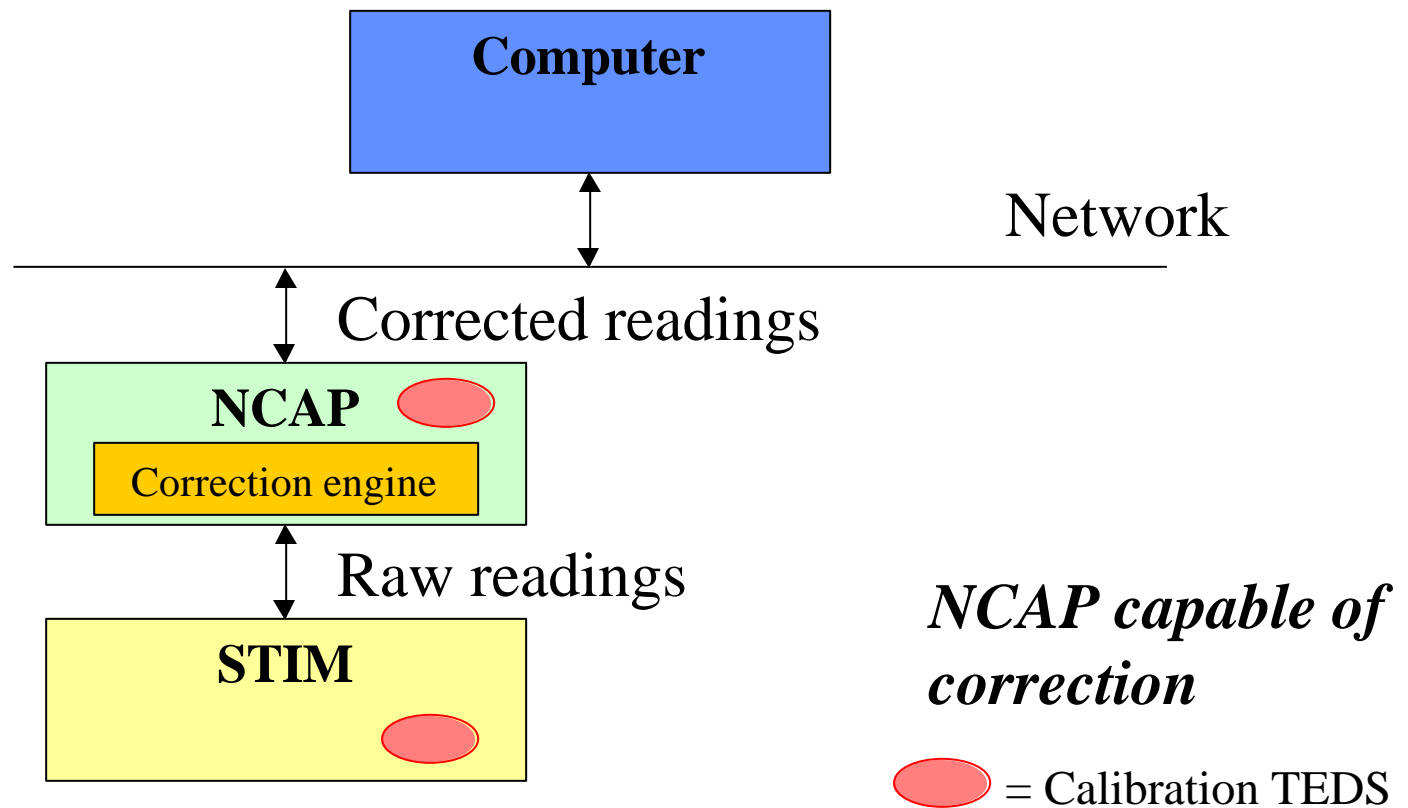
- **Big NCAP and little STIMs:**
e.g. NCAPs with multiple 1451.2 ports.
- **Little NCAP and big STIMs:**
e.g. STIMs with many channels.
- **Scalability**
 - type of network
 - processing power
 - type of processor
 - number of channels
 - types of sensors and actuators
 - hardware interface speed
 - connectors or PCB traces



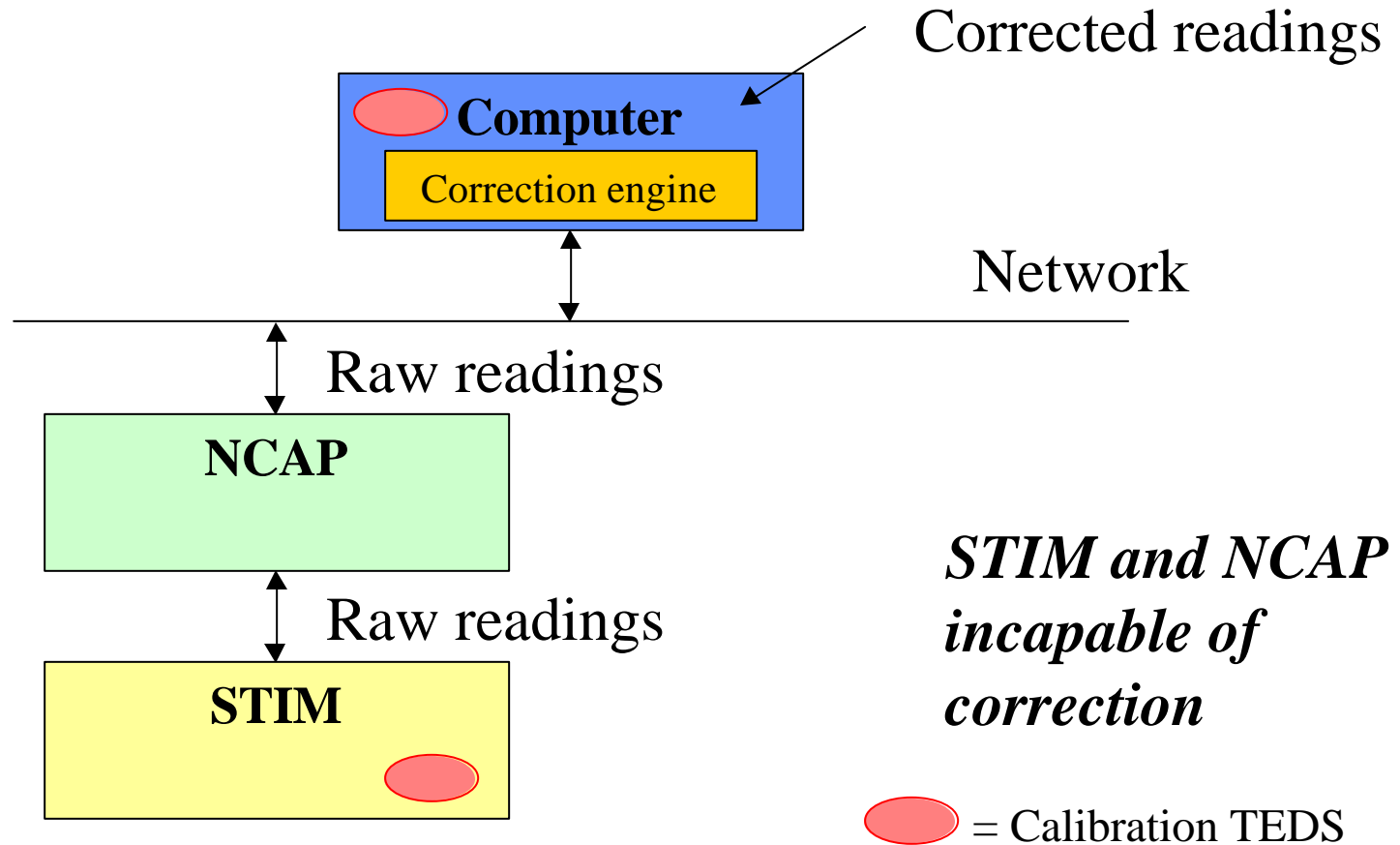
System performance issues



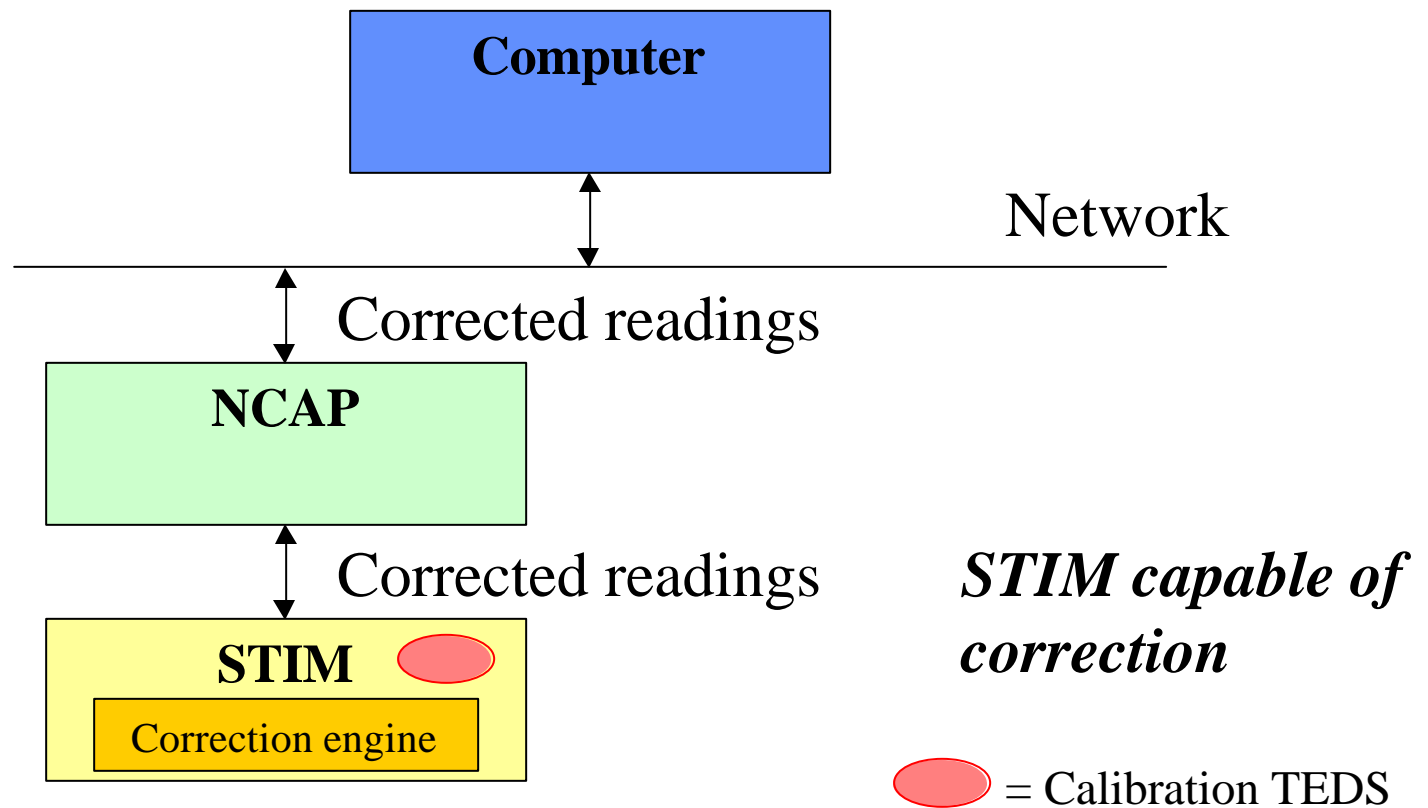
1451.2 correction engine in the NCAP



1451.2 correction engine “elsewhere” in the system

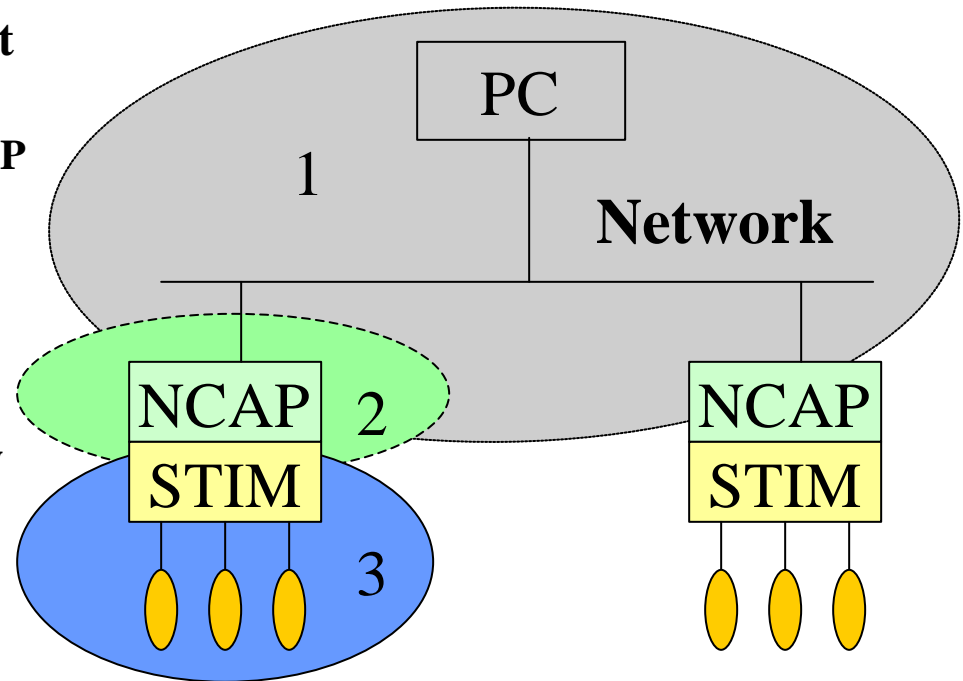


1451.2 correction engine in the STIM

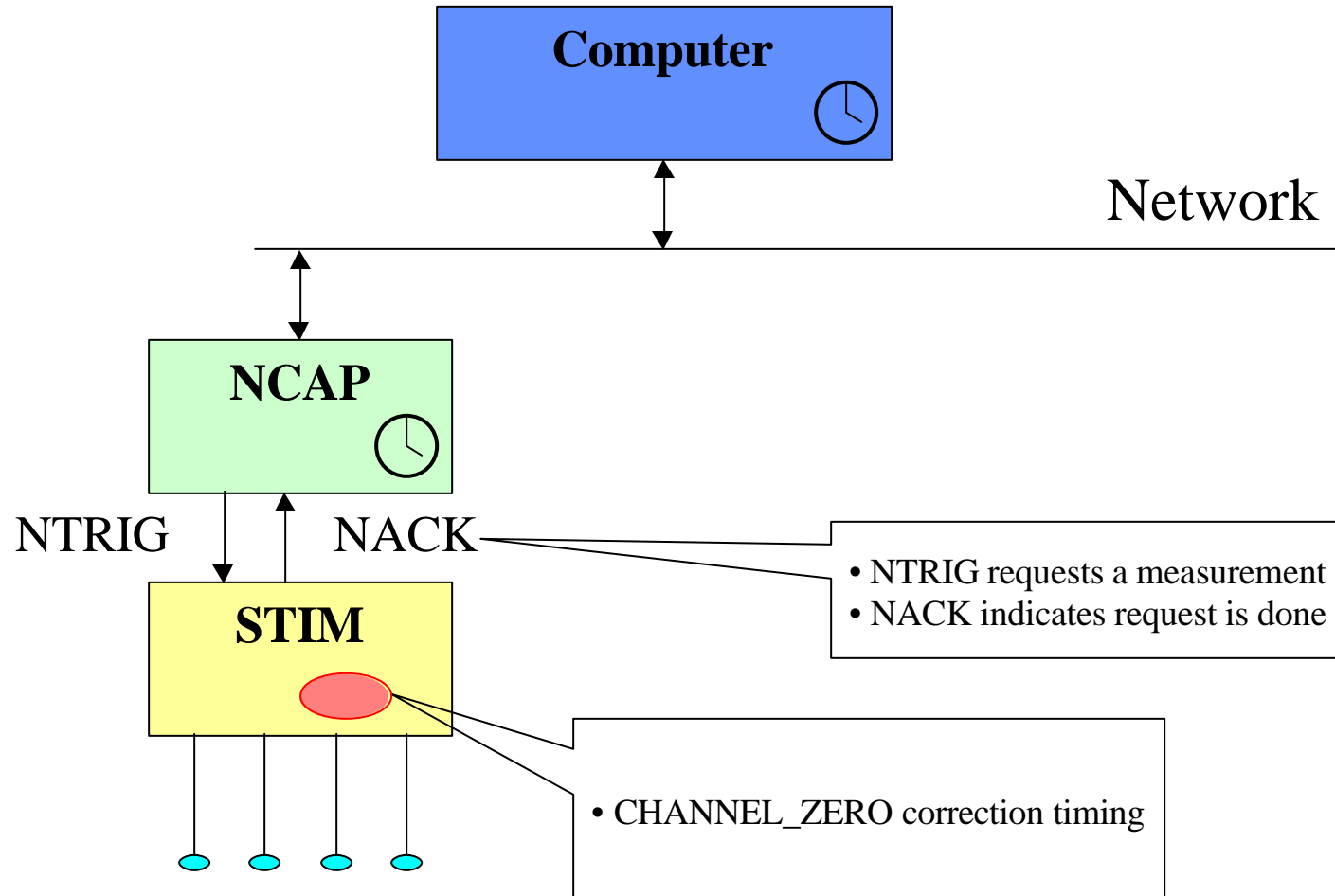


Measurement/control loops

- With the network / 1451.2 architecture there are three loops which may be used for measurement and control.
 - 1) Control by layers above the NCAP
 - 2) NCAP-based control of STIM channels
 - 3) Control **done** within a STIM
- Control may be:
 - Client/server (poll/set, ‘pull’, tightly coupled)
 - Publish/subscribe (‘push’, loosely coupled)



Synchronization



Next steps

- **Consider changes to:**
 - **TEDS**
 - **Data/control model**
 - **Hardware interface**
- **The following presentations will provide perspectives on the implementation of 1451.2 and more information on proposed changes.**